Amendments to the Specification:

Please replace the paragraph, beginning at page 1, line 8, with the following rewritten paragraph:

The present invention relates to a slab waveguide ~~constituted~~ comprising ~~by~~ a photonic crystal, having a refractive index distribution in the film thickness direction, and used in an optical planar circuit~~,~~. The present invention also relates ~~and~~ to a method of manufacturing the slab waveguide.

Please replace the paragraph, beginning at page 1, line 18, with the following rewritten paragraph:

The slab waveguide shown in FIG. 21(a) ~~is constituted by~~has a substrate 201 and a slab-type photonic crystal 200 forming a slab 203 on the substrate 201. Cylindrical vacancies 202 are formed in the slab 203. The vacancies 202 extend in the thickness direction of the slab 203 and are two-dimensionally and periodically arranged parallel to the substrate 201. The slab 203 is uniform in refractive index. The refractive index of the slab 203 is larger than that of the substrate 201. The thus-formed slab-type photonic crystal 200 used as a slab waveguide is capable of reducing the speed of light propagating in the slab waveguide, dispersing the wavelength of light, or deflecting the direction of traveling of light.

Please replace the paragraph, beginning at page 2, line 5, with the following rewritten paragraph:

Propagation of light in a photonic crystal has been ~~discussed~~ known by using as the refractive index of a photonic crystal the effective refractive index defined as the volumetric ratio of the refractive indices of a plurality of materials periodically arranged. Such macroscopic ~~discussion~~ use is effective in a case where the refractive index period is sufficiently smaller than the wavelength of light, because light behaves according to the average of refractive indices. In a case where the refractive index period is close to the wavelength of light, however, light behaves according to each of refractive indices and, therefore, it is necessary to make

microscopic ~~discussion~~ use such as to treat each of different refractive index materials periodically arranged.

Please replace the paragraph, beginning at page 2, line 18, with the following rewritten paragraph:

Actually, in a macroscopic ~~discussion~~use, it is contemplated that if a substrate 201 having a refractive index lower than the effective refractive index obtained by averaging the refractive index of vacancies 202 and the refractive index of the slab 203 is used, light propagates through the above-described slab-type photonic crystal 200. However, according to a microscopic ~~discussion~~use, light 204 incident upon the slab-type photonic crystal 200 in the slab waveguide with such a substrate propagates through a slab 203 portion periodically formed and having a refractive index higher than that of the substrate 201, but diffused light 206 in the vacancy portions 202 leaks to the substrate 201 side because the reflective index of the vacancies 202 is lower than that of substrate 201, and only part of diffused light 206 can propagates through the vacancies 202. In this case, the amount of light 205 emergent from the above-described slab-type photonic crystal 200 is substantially zero.

Please replace the paragraph, beginning at page 3, line 20, with the following rewritten paragraph:

Each of the slab waveguides shown in FIGS. 21(a) and 21(b) ~~is constituted~~comprises ~~by~~ a slab-type photonic crystal 200. The slab-type photonic crystals 200 of these slab waveguides are formed in the same manner except that they differ in thickness from each other. In each slab-type photonic crystals 200, cylindrical vacancies 202 are formed. The vacancies 202 extend in the thickness direction of the slab 203 and are two-dimensionally and periodically arranged parallel to the major surfaces of the slab 203. The slab 203 is uniform in refractive index.

Please replace the paragraph, beginning at page 4, line 5, with the following rewritten paragraph:

In a case where a slab waveguide ~~is constituted~~comprising only ~~by~~ the above-described slab photonic crystal 200 with no substrate, the slab photonic crystal 200 behaves like a lens

waveguide, slab portions having a higher refractive index act as a lens, and leakage by diffusion does not occur in the vacancies 202 having a lower refractive index. As a result, incident light 204 propagates in the slab-type photonic crystal 200 without diffusing.

Please replace the paragraph, beginning at page 6, line 21, with the following rewritten paragraph:

In the arrangements according to ~~the~~ conventional methods, the refractive index of the substrate is higher than that of the vacancies in the photonic crystal and, therefore, ~~a~~ leakage of light from the vacancies occurs and light cannot propagate. The arrangement using no substrate and free from leakage of light entails, for satisfaction of single-mode conditions, the need to set the film thickness of the slab to a small value of 1 μm or less or to an increased value of 10 μm or greater. If the film thickness of the slab is reduced, coupling to an optical fiber is difficult. If the film thickness of the slab is increased, it is difficult to fabricate the slab waveguide. Moreover, the strength of the slab in a single state is so low that the slab waveguide is incapable of being put to practical use.

Please replace the paragraph, beginning at page 15, line 3, with the following rewritten paragraph:

To achieve the above-described object, according to the present invention, there is provided a slab-type photonic crystal having a two-dimensional crystal grating having vacancies formed in a slab in the film thickness direction of the slab and two-dimensionally and periodically arranged, and constituted by a slab refractive index portion and columnar member portions, wherein the slab refractive index portion includes a maximum-refractive-index portion having the maximum refractive index in a certain region within the film thickness of the slab and a lower-refractive-index portion in which the refractive index is reduced according to a quadratic function of the distance from the maximum-refractive-index portion, and wherein a refractive index distribution constant relating to the lower-refractive-index portion is about 1 mm^{-1} or greater.

Please replace the paragraph, beginning at page 15, line 18, with the following rewritten paragraph:

If the slab-type photonic crystal having quandratically distributed variation in refractive index in the film thickness direction such that the refractive index distribution constant is about 1 mm^{-1} or greater is used, light can propagate through the slab-type photonic crystal without leaking from the same regardless of the film thickness of the slab-type photonic crystal even if the photonic crystal is combined with a substrate. Also, single-mode conditions can be satisfied and the film thickness can be set so as to match the mode field diameter of an optical fiber.

Please replace the paragraph, beginning at page 36, line 22, with the following rewritten paragraph:

Thus, the slab-type photonic crystal 47 in which the incidence-end surface and the emergence-end surface have a radius of curvature of about 0.1 μm^{-1} or greater, or the slab-type photonic crystal 67 formed by periodically arranging portions in the slab refractive index portion 61 and the vacancies 62 forming incidence-end and emergence-end surfaces having a radius of curvature of about 0.1 μm^{-1} or greater is used to ensure that the beam trail is within the film thickness of the slab-type photonic crystal regardless of the film thickness of the slab-type photonic crystal 47 or 46. Even though the slab waveguide has a substrate, the beam trail does not reach the boundary on the substrate, so that light can propagate through the waveguide without leaking. Further, the radius of curvature at each end surface functions like a lens so that the speed of propagation of light is constant with respect to any incident angles, so that single-mode conditions can be satisfied. Therefore, the film thickness of the slab-type photonic crystal can be set so as to match the mode field diameter of an optical fiber and the slab-type photonic crystal can be easily coupled to the optical fiber.

Please replace the paragraph, beginning at page 66, line 21, with the following rewritten paragraph:

According to the fourth aspect of the present invention, in the slab waveguide in the third aspect of the invention, the slab waveguide ~~according to claim 3~~, wherein the refractive index of said slab refractive index portion in the direction perpendicular to the slab surface is reduced in accordance with a quadratic function or a approximately quadratic function of the distance from the predetermined portion.

Please replace the paragraph, beginning at page 67, line 3, with the following rewritten paragraph:

According to the fifth aspect of the present invention, in the slab waveguide in the third aspect of the invention, the slab waveguide ~~according to claim 3~~, wherein the predetermined portion is a region of a predetermined length other than the end portions in said slab refractive index portion, and the refractive index of said slab refractive index portion in the direction perpendicular to the slab surface is substantially constant in the region having the predetermined length other than the end portions in said slab refractive index portion and is reduced in accordance with a quadratic function or a approximately quadratic function of the distance from an end of the region having the predetermined length.

Please replace the paragraph, beginning at page 67, line 16, with the following rewritten paragraph:

According to the sixth aspect of the present invention, in the slab waveguide in the fourth or fifth aspect of the invention, a refractive index distribution constant relating to the refractive index of the portion in which the refractive index is reduced in accordance with the quadratic function or the approximately quadratic function of the distance is about 1 mm^{-1} or greater.

Please replace the paragraph, beginning at page 68, line 3, with the following rewritten paragraph:

According to the eight aspect of the present invention, in the slab waveguide in the fourth or fifth aspect of the invention, a refractive index distribution constant relating to the refractive index of the portion in which the refractive index is reduced in accordance with the quadratic function or the approximately quadratic function of the distance is such a value that the total optical path length is defined by an optical integer multiple pitch of about 0.5.

Please replace the paragraph, beginning at page 69, line 22, with the following rewritten paragraph:

According to the thirteenth aspect of the present invention, in the slab waveguide in the eleventh or twelfth aspect of the invention, the curved surface has a radius of curvature of about 1 μm or greater.

Please replace the paragraph, beginning at page 70, line 1, with the following rewritten paragraph:

According to the fourteenth aspect of the present invention, in the slab waveguide in the eleventh or twelfth aspect of the invention, the curved surface has a radius of curvature of about 1/10 μm or greater of the total number of periods if a constituent unit formed by the slab refractive index portion and the columnar members is one period.

Please replace the paragraph, beginning at page 71, line 13, with the following rewritten paragraph:

According to the twentieth aspect of the present invention, in the slab waveguide in the sixteenth or seventeenth aspect of the invention, the radius of curvature of the curved surface is about 0.1 μm or greater.